

FORM PTO-1390 (REV 5-93)		U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		SG 00318	
		U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 09/623546	
INTERNATIONAL APPLICATION NO	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED	
PCT/SE99/00254	24 February 1999 (24.02.99)	05 March 1998 (05.03.98)	
TITLE OF INVENTION			
REFLECTING MATERIAL			
APPLICANT(S) FOR DO/EO/US			
ANDERSSON, Stig			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
<ol style="list-style-type: none"> <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(I). <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ol style="list-style-type: none"> <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). <input type="checkbox"/> has been transmitted by the International Bureau. (<i>Not Known</i>) <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(C)(2)). <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <ol style="list-style-type: none"> <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). <input type="checkbox"/> have been transmitted by the International Bureau. <input type="checkbox"/> have not been made; however, the time limited for making such amendments has NOT expired. <input checked="" type="checkbox"/> have not been made and will not be made. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). 			
Items 11 to 16 below concern other document(s) or information included:			
<ol style="list-style-type: none"> <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. <input type="checkbox"/> A substitute specification. <input type="checkbox"/> A change of power of attorney and/or address letter. <input checked="" type="checkbox"/> Other items of information: <ol style="list-style-type: none"> International Search Report International Preliminary Examination Report Annexed Claims 1 - 13 			

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:) Group Art Unit: TBA
)
ANDERSSON, Stig) Examiner: TBA
)
Filed: To be determined) Attorney Docket: SG 00318
)
Serial No.: TBA)
)
For: REFLECTING MATERIAL) Date: September 5, 2000

HON. COMMISSIONER OF
PATENTS AND TRADEMARKS
WASHINGTON, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Prior to examination of the above referenced application please substitute claims 1-13 as listed on annexed sheets 1-2 attached to the international preliminary examination report. Also, prior to examination, please amend the claims of these sheets as follows.

In the claims:

In claim 3, please delete "or 2".

In claim 4, please delete "or 2".

In claim 5, please delete "or 2".

In claim 7, please change "any of claims 1-6" to
--claim 1--.

In claim 9, please change "any of claims 1-8" to
--claim 1--.

In claim 11, please change "any of claims 1-5" to
--claim 1--.

REMARKS

Claims 1-13, as listed on annexed sheets 1-2, have been amended to remove any improper multiple dependent claims from the application.

In the event the Examiner has further difficulties with the examination and/or allowance of the application, he/she is invited to contact the undersigned agent for applicant by telephone at (412) 380-0725, if necessary to resolve any remaining questions or issues by interview and/or Examiner's Amendment as to any matter.

Respectfully submitted,

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REFLECTING MATERIAL

The present invention refers to a material for
5 thermoforming as well as to the use of this material for
the manufacturing of a reflecting product by means of
thermoforming.

While performing different activities during more or
less bad lighting, it is important for a person performing
10 the activities to be completely visible. At present, a
person can obtain a lower degree of protection by different
types of reflex tapes, so as to be visible during poor
light conditions. This does not only apply to different
types of spare time activities, such as bicycling and horse
15 riding, but also to activities related to employment, such
as for instance firemen and policemen, which have to
protect themselves with adequate reflector means when
working professionally under conditions with low levels of
lighting. In this connection a "reflector means"
20 accomplishes a reflection in which light is reflected in
directions close to the direction from which it came.

In the nowadays existing traffic environment, it is
especially important to protect the head, and this applies
to children as well as grown-ups. However, conventional
25 helmets are not easily noticed, for example, by motorists
at night, and the user may risk injury from a traffic
accident on such occasions even if a helmet is used. In
order to alert a motorist under these conditions, several
types of reflecting warning signs, which are visible at
30 night, are now commercially available.

Ordinary plane reflector means, however, have a
limited protecting effect by only emitting light when
struck by light from only one direction. It is true that
different kinds of adhesive reflecting tapes exist which
35 can be fastened for example on clothes or helmets. However,
a self-adhesive material, such as a sticker, cannot be

applied to a curved surface due to the formation of wrinkles. On the same grounds, it can neither be applied to a material in the form of a sheet which subsequently is fixed onto a curved surface by means of thermoforming, since the material then will crack or crackle. Due to the above mentioned problems, reflecting materials according to the state of the art rapidly lose their reflecting properties when applied to irregular or curved surfaces.

The purpose of the invention is thus to provide a reflecting material which can be used both as a reflecting plane sheet per se and as a material for thermoforming, preferably by means of vacuum forming, to a curved or irregular surface, the material retaining its reflecting property without crack formation or cracking. In order to achieve this purpose, the invention has obtained the characterizing features of claim 1 and its use has obtained the characterizing features of claim 16.

In order to explain the invention in more detail, reference is made to the accompanying drawing, in which

FIG 1 schematically shows a cross section through a reflecting material in the form of a sheet according to the invention,

FIG 2 schematically shows a cross section through a further development of the embodiment of the material according to the invention, which is shown in FIG 1,

FIG 3 schematically shows a cross section through an alternative embodiment of the material according to the invention, and

FIG 4 schematically shows a cross section through a material according to a preferred embodiment of the invention.

In FIG 1 the material according to the invention is shown in its most simple form, and consists of a plane sheet 1 which is coated with a reflecting layer 2. The sheet 1 can be of every type of plastic material. However,

it is preferred that the sheet comprises a transparent thermoplastic polymer material, preferably crystal-clear polyvinyl chloride (PVC) or polyester, the polyester being preferred since it is more harmless to the environment.

5 The reflecting layer 2 comprises a suspension of pearls, for example of glass or plastic, in an adhering substance, preferably a lacquer. In this connection a lacquer means a non-pigmented liquid with an organic film forming substance which can be a natural resin, a synthetic
10 resin or an oil. Preferably a so-called screen printing lacquer is used.

It is an important aspect of the invention that pearls of a certain size are mixed with the adhesive substance. Preferably, the pearls have a diameter between
15 0.01 and 0.05 mm. The adhesive substance must be able to attach to the plastic at the same time as it shall be able to bind to the pearls. Thus, the adhering substance comprises an etching transparent glue coating. In this connection etching refers to an increase in surface
20 roughness of the plastic by dissolution of the same. After the application of the reflecting layer 2, the adhering substance in the form of a lacquer is hardened, preferably by means of heat, but it can also be hardened in other ways, for example by means of radiation.

25 In order to obtain a reflecting laminated material according to the invention, the adhering substance and pearls of for example glass or plastic are mixed into a suspension which must have a suitable consistency so that the pearls of microscopic size will be transferred to the
30 plane sheet 1 by means of a known technique in the form of screen printing (silk screen processing). This is a method which normally is used for applying a pattern to a plastic sheet which is to be subjected to thermoforming. The size of the pearls is thus also adapted to be able to pass
35 through the open holes of a screen stencil which normally

is used for pressing a pattern medium against the sheet. When the pearls used are of glass, they must be polished pearls of high quality. The same type of glass pearls as in existing reflecting tapes can be used with advantage.

- 5 Preferably, the size of the glass pearls lies within the range of 0.01-0.05 mm.

By this procedure, the suspension is anchored on the plane material, a reflecting surface being obtained. The more pearls mixed into the suspension, the better
10 reflectance is achieved. In this connection the amount of glass pearls suspended in the adhering substance in the form of a lacquer could surprisingly comprise as much as 85 %. This results in the consumption of 1 kg glass pearls for covering 4-5 m² of the sheet, which after thermoforming
15 for example can be used for shells for about 50 helmets of normal size.

The material according to the invention can in this embodiment also be used for achieving a reflection in two directions, by the reflective layer being applied to both
20 sides of a suitable surface. It is of advantage if this surface is a sheet of plastic material which can be thermoformed. Preferably all kinds of existing materials of polyvinyl chloride (PVC) are used, i.e. all thermoplastic materials which comprise polymers of vinyl chloride. The
25 plane reflecting material can also be used without thermoforming in the form of a traffic sign or another warning sign indicating danger or other circumstances which should be observed by the public.

When the reflective layer 2 has been applied to the
30 sheet 1, other patterns can be printed on the material according to the invention. This is then thermoformed, for example by means of vacuum forming, to a shape corresponding to the curved surfaces, which the shells thus formed are intended to fit. The thermoplastic material
35 according to the invention, in the form of a plane or

flexible sheet or foil of a thickness which is sufficient for vacuum forming, is then heated to its vacuum forming temperature and formed to a general contour of a mould by means of a pressure difference. Thus, vacuum forming is performed by means of known techniques at 130 °C, the material being drawn and stretched to a shell which for example has the shape of a helmet.

After cooling, the thin shells formed are sawn into separate units, and holes are optionally punched out in them. If the shells are to be used in a finished product in the form of a helmet, the shell is finally glued onto an inner helmet which has a protective effect on the head.

The helmet can then, if desired, be built in with a further plastic layer. This can be necessary since the virtual reflection can be reduced, i.e. in humid weather. For this reason a further coating is applied to the finished product, e.g. a layer which protects the reflecting layer and strengthens it even more. As shown in FIG 2, this can be achieved by a further layer 3 of preferably PVC being applied by means of for example high-frequency welding to the reflecting layer 2 which in turn is disposed on the plane sheet 1.

A more cost-efficient embodiment of the invention according to FIG 1 is shown in FIG 3, a plane sheet 1 of preferably a plastic material being used as above, said material being workable by means of vacuum forming. In this embodiment a layer 4a of an adhering substance is disposed on the sheet 1, and a thin layer 5 of pearls is applied to the layer 4a. A further layer 4b of an adhering substance is again disposed over this layer 5 of pearls.

The layers 4a and 4b preferably consist of the same transparent glass-clear adhering substance in the form of a lacquer, the lacquer in the layer 4a being etching as in the previous embodiment.

With reference to FIG 3, the reflecting laminated material is achieved by the etching layer 4a of adhering substance being applied to the sheet 1. Pearls are spread onto this layer before it has dried. This can for example
5 be accomplished mechanically with an equipment which usually is utilised for coating with different kinds of powders. Glass pearls are for example spread in this procedure so that they will fall down onto the still sticky layer 4a, a monolayer of glass pearls contacting the same
10 with non-adhering pearls on the top. The sheet with accompanying layers 4a and 5 is then allowed to pass an oven for curing of the adhering substance in the layer 4a. When this layer has been cured, non-adhering glass pearls can be sucked off and reused. Another layer 4b of adhering
15 substance is then applied to the layer 5 of glass pearls, the sheet with accompanying layers then being allowed to pass the oven again for curing of the layer 4b.

The material according to this embodiment of the invention can also be vacuum formed into a reflecting shell
20 to be applied to a curved surface without any crackle formation taken place during the forming procedure. The reflecting surface is sufficiently well adapted for many applications in order to provide for an efficient reflecting effect.

25 In FIG 4 an embodiment is shown which is especially preferred when the material according to the invention is to be used for reflecting helmets. By arranging the product in the form of a shell from the material according to the invention for example on the inside of a bicycle helmet, in
30 which holes have been cut out for the reflecting material, the reflecting product can be used where it is more protected from the surrounding world. In this embodiment this can be achieved by a layer of the material according to the invention being arranged on that side of the sheet 1
35 which in the finished helmet will not be directed towards

the light source, i.e. the sheet 1 acts as a protecting layer for the other layers.

With reference to FIG 4, a colour layer 6 is arranged between the sheet 1 and the layer 4a of an adhering substance. The colour layer 6 comprises a transparent dye known in the art, which can be excluded in dependence of the design and appearance of the final product. The reflecting layer is arranged as in the preceding embodiment in the form of a single layer of pearls, for example of glass or plastic, between two layers, 4a and 4b, of adhering substance. In this connection the adhering substance used should be able to etch dyes as well as plastics.

A layer 7 of a material with high gloss, for example silver or aluminium, is disposed on the layer 4b of adhering substance in order to further amplify the reflection. Preferably, aluminium particles are used. Thus, when the reflecting layer 5 is illuminated, the light not immediately reflected by this layer will be reflected with total reflectance by the layer 7 and re-transmitted towards the observer after reflection by the pearls in the layer 5.

The layer 7 is preferably applied to the laminate according to the invention as a paste of commercial aluminium particles by means of the above-mentioned technique in the form of screen printing.

The reflecting laminated material according to the invention can then be heated to a temperature which is suitable for vacuum forming, e.g. 130 °C, vacuum forming then being performed as described above. The reflecting material in the form of a sheet according to the invention must in this connection have a thickness which is sufficient considering the product contemplated after vacuum forming. The material can for example be vacuum formed into a shell in the form of a helmet which becomes highly reflecting from the outside with the reflecting

layer on the inside of the helmet, the reflecting layer thus being protected against all types of damages. In this way a helmet of impact-resistant plastic can be achieved with reflecting patterns as well as usual patterns, which
5 can result in increased road safety, especially for children.

It should be observed, that a colour layer, if desired, can be arranged in a corresponding way in other embodiments of the invention. In this connection the
10 location of the colour layer in the laminate is not crucial. A dye can also be mixed into the suspension of pearls and adhering substance, a reflection of the corresponding colour then being obtained. In this connection the dyes should also be transparent.
15 Furthermore, it is important that all transparent components in the material according to the invention retain this property after thermoforming, such as vacuum forming.

Warning articles manufactured from the material of
20 the present invention present a reflective construction which is durable, rather cheap and quite visible under poor natural light conditions, especially at night, when the reflecting articles are illuminated by an external active light source, such as a light from a head light of a car.
25 By the vacuum forming property of the inventive material, the invention can be used for increased safety, especially on the roads. Products having an irregular or curved surface can be produced with a functional reflectance when the present invention is used. Thus, all kinds of light
30 reflecting products can be achieved, such as bicycle helmets, protective helmets for building workers and playing children, and so on. Accordingly, the invention can be used as a reflective device with the capability of reflecting light and thus being visible from all angles,
35 i.e. a retro-reflecting device generating a reflection in

all directions and usable on a person as such. Other products for increased road safety can also be obtained by using the invention when a more or less completely reflecting surface is desired, such as hub caps with
5 ornaments and reflective patterns.

CLAIMS

1. Use of a material comprising a reflecting layer (2,5) of pearls of transparent glass or plastic at least partially embedded in an adhering transparent substance, said layer being arranged at one side thereof adjacent to a first transparent plastic layer (1) comprising polyvinyl chloride or polyester, for manufacturing, by means of thermoforming, a retro-reflecting shell which, after cooling, has a curved or irregular surface shaped as a helmet with the capability of reflecting light in all directions.

2. Use as in claim 1, characterized in that the thermoforming is vacuum forming.

3. Use as in claim 1 or 2, characterized in that the material is a plane sheet or a foil.

4. Use as in claim 1 or 2, characterized in that a second transparent plastic layer (3) comprising polyvinyl chloride or polyester is arranged on the other side of the layer of pearls, opposite to said first transparent plastic layer (1).

5. Use as in claim 1 or 2, characterized in that the adhering substance comprises a first and a second layer (4a, 4b) surrounding the layer (5) of pearls, the first layer (4a) being arranged adjacent to said first transparent plastic layer (1).

6. Use as in claim 5, characterized in that the pearls in the layer (5) form a monolayer.

7. Use as in any of claims 1-6, characterized in that the pearls have a diameter between 0.01 and 0.05 mm.

8. Use as in claim 4, characterized in that when the second plastic layer (3) comprises polyvinyl chloride it is high-frequency welded to the reflecting layer (2).

AMENDED SHEET

9. Use as in any of claims 1-8, c h a r a c -
t e r i z e d in that the adhering transparent substance
is a lacquer.

10. Use as in claim 9, c h a r a c t e r i z e d
5 in that the lacquer is a screen printing lacquer.

11. Use as in any of claims 1-5, c h a r a c -
t e r i z e d in that a layer (6) of a transparent dye
is arranged adjacent to said first transparent plastic
layer (1).

10 12. Use as in claim 5, c h a r a c t e r i z e d
in that a high gloss material layer (7) is arranged
adjacent to said second layer (4b) of the adhering
substance opposite to the reflecting layer (5) of pearls.

15 13. Use as in claim 12, c h a r a c t e r i z e d
in that the high gloss material layer (7) comprises
aluminium particles.

1/1

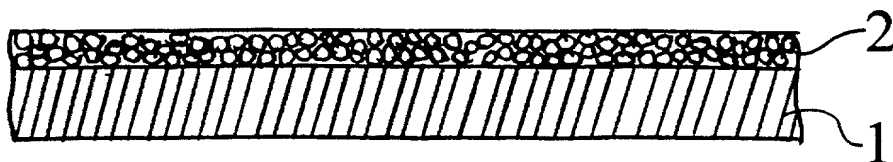


Fig 1

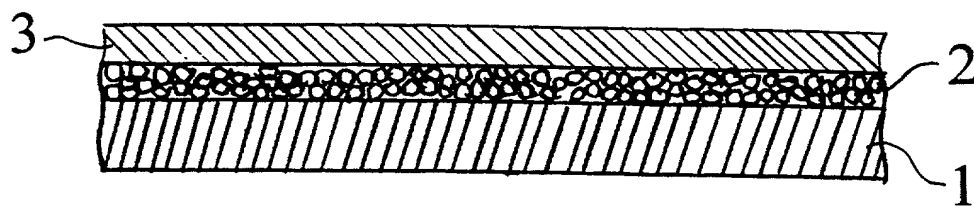


Fig 2

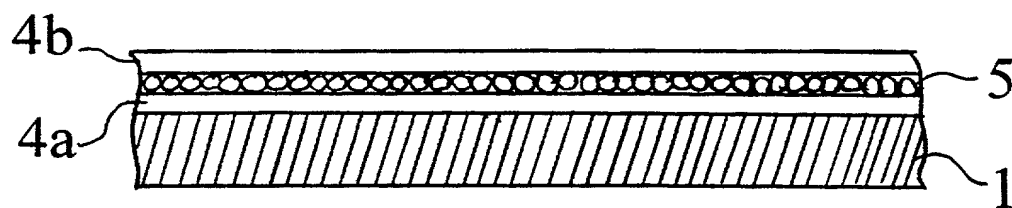


Fig 3

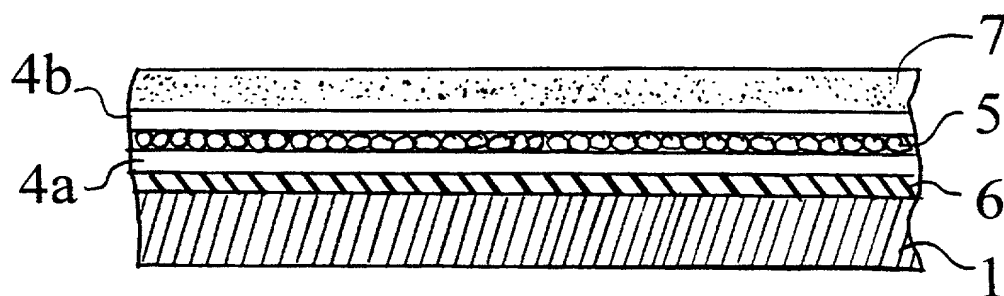


Fig 4

Declaration For U.S. Patent Application

(PTO/SB/01)

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

REFLECTING MATERIAL

the specification of which (Check one of blocks 1, 2 or 3)

1. ☐ is attached hereto.2. ☒ was filed on 24 February 1999 (24.02.99) as International PCT Application Serial No. PCT/SE99/00254 and was amended on _____ (if applicable).3. ☐ was filed on _____ as U.S. Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above

I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed:

List of Prior Foreign Applications (if applicable)**CERTIFIED COPY ATTACHED?**

<u>9800689-3</u> (Application Number)	<u>SWEDEN</u> (Country)	<u>5 March 1998</u> (Day/Month/Year Filed)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<u> </u> (Application Number)	<u> </u> (Country)	<u> </u> (Day/Month/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No
<u> </u> (Application Number)	<u> </u> (Country)	<u> </u> (Day/Month/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No
<u> </u> (Application Number)	<u> </u> (Country)	<u> </u> (Day/Month/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No

☐ Additional foreign application numbers are listed on the attached sheet, PTO/SB/02B - Supplemental Priority Data Sheet or similar sheet

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below

List of U.S. Provisional Applications (if applicable)

<u> </u> (Application Number)	<u> </u> (Day/Month/Year Filed)
<u> </u> (Application Number)	<u> </u> (Day/Month/Year Filed)

☐ Additional provisional application numbers are listed on the attached sheet, PTO/SB/02B - Supplemental Priority Data Sheet or similar sheet.

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

List of U.S. Parent Application Or PCT Parent Numbers (if applicable)

<u> </u> (Number)	<u> </u> (Day/Month/Year Filed)	<u> </u> (Status: Abandoned; Pending; Patent Number, if applicable)
<u> </u> (Number)	<u> </u> (Day/Month/Year Filed)	<u> </u> (Status: Abandoned; Pending; Patent Number, if applicable)
<u> </u> (Number)	<u> </u> (Day/Month/Year Filed)	<u> </u> (Status: Abandoned; Pending; Patent Number, if applicable)

☐ Additional U.S. or PCT international application numbers are listed on the attached sheet, PTO/SB/02B - Supplemental Priority Data Sheet or similar sheet

10

And I hereby appoint as principal attorneys and agents, James O. Ray, Jr., Reg. No. 27,666; Forest C. Sexton, Reg. No. 22,054; Edmond S. Miksch, Reg. No. 38,558; James R. Stevenson, Reg. No. 38,755; John B. Sotak, Reg. No. 20,529; Gary J. Falce, Reg. No. 29,304; Elroy Strickland Reg. No. 22,546; Amos Bartoli, Reg. No. 42,299; Michele K. Yoder, Reg. No. 41,562 and Robert A. Shack, Reg. No. 29,976.

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 FACSIMILE: 412-380-0748

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 of Title and that such willful false statements may jeopardize the validity of the application or any patent issue thereon.

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Inventor's signature: [Signature] Date: _____

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Full Name of Second Inventor: _____

Inventor's signature: _____ Date: _____

Residence: _____
 (Street, City, State, Zip Code, Country)

Citizenship: _____

Post Office Address: _____

Full Name of Third Inventor: _____

Inventor's signature: _____ Date: _____

Residence: _____
 (Street, City, State, Zip Code, Country)

Citizenship: _____

Post Office Address: _____

Full name of Fourth Inventor: _____

Inventor's signature: _____ Date: _____

Residence: _____
 (Street, City, State, Zip Code, Country)

Citizenship: _____

Post Office Address: _____

[] Additional inventors are listed on the attached sheet, PTO/SB/02A - Supplemental Additional Inventor(s) Sheet or similar sheet.